## DETAILED ACTION

### *Continued Examination Under 37 CFR 1.114*

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 4 November 2009 has been entered.

### *Claim Rejections - 35 USC § 103*

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims 1, 8-10, and 19-22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Morris (U.S. Patent No. 5,792,411) in view of Mitwalsky (U.S. Patent No. 4,843,363) for the reasons cited in the previous Office action. Regarding claim 1, Morris teaches a master mold (see column 3, lines 49-56) which may be comprised of a variety of materials, including glass, ceramic, or metal materials (see column 4, lines 46-52). Morris further teaches that the master tool may be formed from a multi-layered substrate comprising a combination of materials in the layers (see column 5, lines 4-7).

Morris teaches that the master tool is formed by laser ablation of the substrate using a mask, thereby imparting the desired microstructure to the substrate (see column 5, lines 14-39). Mitwalsky teaches a process for laser ablation (see column 2, lines 10-14) of a multi-layered structure comprising a metal layer covered by a ceramic material (see column 2, lines 55-60, wherein silicon nitride is a known ceramic material). Mitwalsky teaches that by having a metal layer underlying the ceramic layer, the depth to which the ablation process proceeds can be precisely limited provided that the energy density of the laser is lower than that required for ablation of the metal (see column 4, lines 34-37). As a result, the metal layer is exposed upon completion of the ablation process. Since the ceramic material can be ablated using a lower energy density than the metal, it must have a lower grinding speed. It would have been obvious to one of ordinary skill in the art at the time of the invention to have selected materials for the master mold taught by Morris consisting of a ceramic material on a metal layer, as taught by Mitwalsky, for the benefit of providing a configuration in which the depth of the ablation process and resulting microstructure could be controlled precisely and automatically without the need for end point detection systems (see Mitwalsky, column 4, lines 31-36).

Regarding claim 8, Morris teaches a master mold (see column 3, lines 49-56) which may be comprised of a variety of materials, including glass, ceramic, or metal materials (see column 4, lines 46-52). Morris further teaches that the master tool may be formed from a multi-layered substrate comprising a combination of materials in the layers (see column 5, lines 4-7). Morris teaches that the master tool is formed by laser ablation of the substrate using a mask, thereby imparting the desired microstructure to

the substrate (see column 5, lines 14-39). Mitwalsky teaches a process for laser ablation (see column 2, lines 10-14) of a multi-layered structure comprising a metal layer covered by a ceramic material (see column 2, lines 55-60, wherein silicon nitride is a known ceramic material). Mitwalsky teaches that by having a metal layer underlying the ceramic layer, the depth to which the ablation process proceeds can be precisely limited provided that the energy density of the laser is lower than that required for ablation of the metal (see column 4, lines 34-37). As a result, the ceramic layer is selectively removed and the metal layer is exposed upon completion of the ablation process. Since the ceramic material can be ablated using a lower energy density than the metal, it must have a lower grinding speed. It would have been obvious to one of ordinary skill in the art at the time of the invention to have selected materials for the master mold taught by Morris consisting of a ceramic material on a metal layer, as taught by Mitwalsky, for the benefit of providing a configuration in which the depth of the ablation process and resulting microstructure could be controlled precisely and automatically without the need for end point detection systems (see Mitwalsky, column 4, lines 31-36).

Regarding claims 9 and 10, the recited processes for removing the high grinding speed material, specifically sandblasting and chemical etching, do not impart any structure to the master mold other than a fine structure pattern. Since the master mold taught by Morris, as modified by Mitwalsky, has such a fine structure pattern, the prior art also reads on these claims.

Regarding claims 19 and 21, Morris does not teach a master mold wherein the bottom portions of the fine structure pattern are flat. Mitwalsky teaches a structure wherein the bottoms of the fine structure pattern are flat (see Figure 3). It would have been obvious to one of ordinary skill in the art at the time of the invention to have selected materials for the master mold taught by Morris consisting of a ceramic material on a metal layer, as taught by Mitwalsky, for the benefit of providing a configuration in which the depth of the ablation process and resulting microstructure could be controlled precisely and automatically without the need for end point detection systems (see Mitwalsky, column 4, lines 31-36).

Regarding claims 20 and 22, Morris teaches a master mold which may be a multi-layered structure comprised of a variety of materials, including ceramic and metal (see column 4, lines 46-52). Mitwalsky teaches forming a structure comprising a fine pattern wherein the pattern consists of ceramic and the bottom portions consist of a metal material (see column 2, lines 55-60, wherein silicon nitride is a known ceramic material). It would have been obvious to one of ordinary skill in the art at the time of the invention to have selected materials for the master mold taught by Morris consisting of a ceramic material on a metal layer, as taught by Mitwalsky, for the benefit of providing a configuration in which the depth of the ablation process and resulting microstructure could be controlled precisely and automatically without the need for end point detection systems (see Mitwalsky, column 4, lines 31-36).

4. Claims 4, 6, and 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Morris and Mitwalsky as applied to claim 1 above, and further in

view of Nakada (Japan Patent Application No. JP-10321126) for the reasons cited in the previous Office action. Morris, as modified by Mitwalsky, does not teach a master mold suitable for making plasma display panel ribs or having a grid-like protrusion pattern. Nakada teaches a master mold comprised of metal (see [0033]-[0034] and Figure 2). Regarding claim 4, the master mold taught by Nakada is suitable for making plasma display panel ribs (see [0033]). Regarding claim 6, Nakada teaches that the master mold has a fine structure pattern that is a grid-like protrusion pattern comprising a plurality of ridge-like protrusions arranged substantially parallel while intersecting one another with predetermined gaps among them (see [0016] and Figure 7). Regarding claim 7, Nakada teaches a master mold wherein the fine structure pattern comprises ribs having a rib height of 150 to 300 μm, a rib pitch of 150 to 800 μm, and rib width of 50 to 80 μm (see [0008]). It would have been obvious to one of ordinary skill in the art at the time of the invention to have applied the mold and technique taught by Morris, as modified by Mitwalsky, to the production of a master mold for making plasma display panel ribs, as taught by Nakada, for the benefit of producing the master mold at high speed and significantly reduced cost (see Morris, column 11, lines 61-63).

5. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Morris and Mitwalsky as applied to claim 1 above, and further in view of Yang (U.S. Patent No. 6,382,254) for the reasons cited in the previous Office action. Morris, as modified by Mitwalsky, does not teach a master mold suitable for making microfluidic articles. Yang teaches the manufacture of microfluidic articles using a master mold and the injection molding process (see column 3, line 64 through column 4,

line 8). It would have been obvious to one of ordinary skill in the art at the time of the invention to have applied the mold and technique taught by Morris, as modified by Mitwalsky, to the production of a master mold for making microfluidic devices, as taught by Yang, for the benefit of producing the master mold at high speed and significantly reduced cost (see Morris, column 11, lines 61-63).

6. Claims 23 and 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Morris and Mitwalsky as applied to claims 1 and 8 above. Morris teaches a mold which is suitable for duplicating a fine structure with high precision (see column 2, lines 25-27, wherein replication of microstructured arrays can be reasonably interpreted as replication of a fine structure with high precision; see also column 9, lines 2-7 and Table III in column 10, wherein a fine structure is formed in the tool and then replicated using the tool).

***Response to Arguments***

7. Applicant's arguments filed 4 November 2009 have been fully considered but they are not persuasive. In response to applicant's argument that there is no suggestion to combine the references, the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988) and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). In this case, it

is the primary reference (Morris) which provides the motivation to combine the two references by specifically teaching that the master tooling may comprise “a multi-layered substrate 34 comprising one material or a combination of materials in the layers” (see column 5, lines 4-7). Morris also the use of laser ablation to form the desired geometric configuration of the master tooling (see column 5, lines 14-39). Since Mitwalsky also teaches the use of laser ablation to form microstructures on multilayered substrates, the prior art itself provides sufficient motivation for one of skill in the art to combine the teachings of the two references.

Applicant argues that the master tooling taught by Morris is not suitable for duplicating a fine structure with high precision because Morris teaches that the tooling is intended to replicate non-optical quality structured surfaces. Examiner respectfully disagrees. Morris clearly teaches tooling that is intended to replicate a fine structure, as evidenced by the use of the term “microreplication” throughout the patent. Furthermore, Morris teaches a specific example in which an array of holes is formed in a master tool at a density of 10,000 holes per square inch with depths of about 150 to 800 microns and widths of about 120 to 190 microns (see column 9, lines 4-7 and Table III in column 10). While these dimensions may not represent optical quality, they certainly represent a fine structure. This master tooling can be reasonably interpreted as suitable for duplication with high precision because the precision with which the fine structure is replicated from the master tooling has much more to do with the method by which the replicate is produced than how precisely the structure was originally created in the master tool. So long as the method of replicating the structure provides for complete

filling of the cavities formed in the master tooling and for removal of the cured or solidified article from the tooling, the structure will be replicated with high precision. It is also noted that Morris teaches varying parameters such as pulse spacing, power level, pulse length, and focus to produce a desired effect or design (see column 4, lines 8-13), which one of skill in the art recognizes can also be used to affect the precision with which the effect or design is created.

***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to WILLIAM P. BELL whose telephone number is (571)270-7067. The examiner can normally be reached on Monday - Thursday, 8:00 am - 5:30 pm; Alternating Fridays, 8:00 am - 4:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Richard Crispino can be reached on 571-272-1226. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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